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CenUSA: Results and resources for perennial grasses

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Five years ago, USDA invested significant resources in a study (CenUSA) to explore the potential for bioproducts, including energy, from perennial grasses. This session reviews the results from CenUSA and connects agricultural producers and advisers to the decision tools, fact sheets, and videos created by CenUSA to inform and promote perennial grass production and bioproduct development.

CenUSA is a multi-state and multi-disciplinary effort being led by Iowa State University. Project activities took place in Iowa, Indiana, Wisconsin, Minnesota, Nebraska, Illinois, Vermont and Idaho by researchers from Iowa State University, Purdue University, University of Illinois, University of Minnesota, University of Nebraska, University of Wisconsin, University of Vermont, Idaho National Laboratory and from USDA Agricultural Research Service offices in Wisconsin, Nebraska, Illinois, Pennsylvania, and Iowa.

Figure 1 shows the grand vision for the project, the integration of perennial grasses on marginal lands within our traditional crop production system.

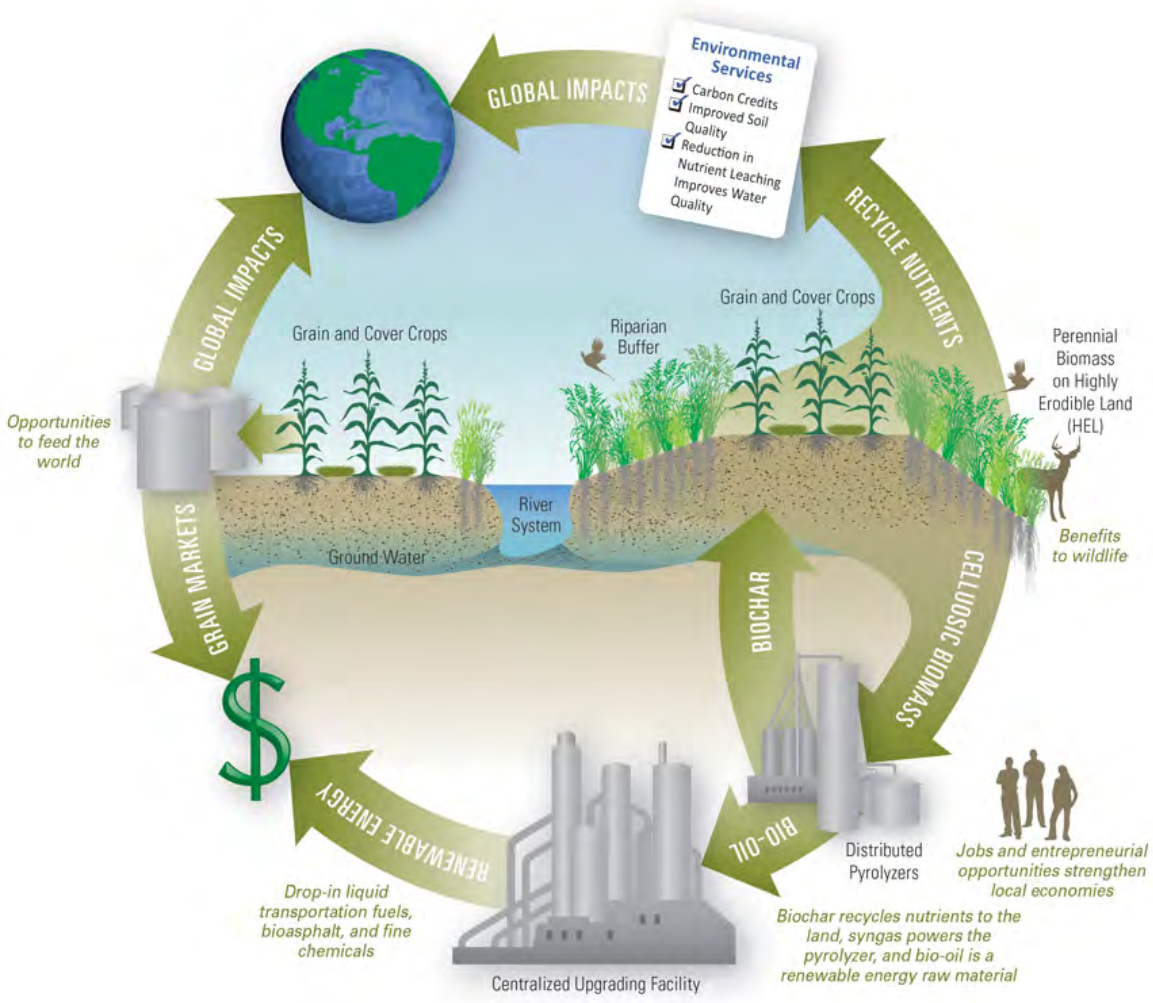

Figure 1. CenUSA Grand Vision

CenUSA has 10 broad platforms within the project:

1. Feedstock Development
2. Sustainable Production Systems
3. Feedstock Logistics
4. System Performance
5. Feedstock Conversion
6. Markets and Distribution
7. Health and Safety
8. Education
9. Extension and Outreach
10. Commercialization

The Feedstock Development platform completed several years of harvest and data collection on regional biomass trials of switchgrass, big bluestem, and indiangrass. The researchers in the platform provided additional documentation of improved winter hardiness and survivorship of switchgrass in USDA Hardiness Zones. They created biomass samples of switchgrass and other warm-season grasses that were used for NIRS calibrations of biomass quality traits for warm-season energy grasses.

The Sustainable Production Systems platform developed a biochar module for cropping system models. Researchers explored the impact biochar applications have on soil pH, readily available water content, soil organic C, and soil bulk density. They have examined yield possibilities in a variety of landscapes.

The Feedstock Logistics platform created an empirical model to predict the influence of weather and swath density on in-field drying characteristics of biomass feedstock. The team examined lodging issues and multiple approaches to biomass harvest. They also performed a techno-economic analysis of grass feedstock logistics, including factors for harvest, road siding, storage; transport, and grinding. The logistics cost of cutting, baling, storing, transporting and conducting a primary grind ranged from roughly $50 to 70 per dry ton. This cost does not include costs for land, amortized establishment, or fertilizer and weed control, nor did it include any profit for the producer.

The System Performance platform evaluated water quality impacts of bioenergy crops and explored scenarios of alternative land uses and their effects on the food, fuel, and energy sectors. The Feedstock Conversion platform developed models to examine biomass conversion for transportation fuels, chemicals, sugars, bio-asphalt, and other bio-based products. The Markets and Distribution platform investigated threshold returns for perennial grasses and explored the opportunities and challenges from a producer perspective of perennial grass adoption.

The Health and Safety platform created a safety and exposure database for risk assessment and established safety guidelines for biochar application. The Education platform developed online course content on biomass feedstock development and production systems, provided numerous undergraduate internships, and conducted graduate-level opportunities for future researchers in the area. The Extension and Outreach platform created fact sheets, videos, webinars, and decision tools, based on the research from the other platforms. They also worked with Master Gardener and 4-H programs to introduce various issues in the perennial grass/biochar/bio-based product system to target audiences. Products developed by the Extension team are archived on the eXtension web site: http://articles.extension.org/pages/72584/. The Commercialization platform has coordinated with industry leaders to convert the research results from CenUSA to industrial use.